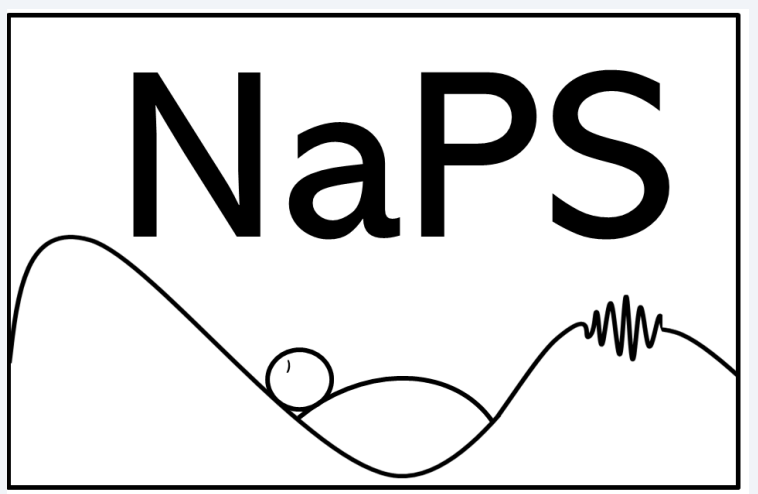


Negative REM TMR: a proposed study of autonomic responses and emotional classification



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Background

Targeted Memory Reactivation (TMR) during rapid eye movement REM - but not SWS - has been shown to selectively reduce subjective arousal¹ and heart rate deceleration (HRD)² in response to negative stimuli. However, whether HRD is modulated by TMR during sleep remains unknown.

While SWS TMR enhances spatial memory performance³, REM TMR has been shown to impair memory for negative emotional content⁴. Whether similar REM TMR effects extend to neutral memories remains an open question.

Prior studies have demonstrated binary classification during REM⁵ and emotion classification during NREM, but emotional classification during REM remains largely unexplored.

Questions

- How does REM TMR of negative items impact on HRD?
- Can we detect the emotion of memories cued by REM TMR using EEG classifiers?
- Does REM -TMR modulate subjective valence and arousal ratings of emotional stimuli?
- Does REM-TMR influence spatial memory, and does this effect differ between negative and neutral stimuli?

Methods — Study design (data yet to be collected)

Day 1
20:00 - 23:00

Overnight
23:00- 8:00

Day 2
8:00-10:00

Day 9
8:00-10:00

Learning Phase 1 (valence rating)
Learning Phase 2 (arousal rating)
Pre-sleep Test Phase

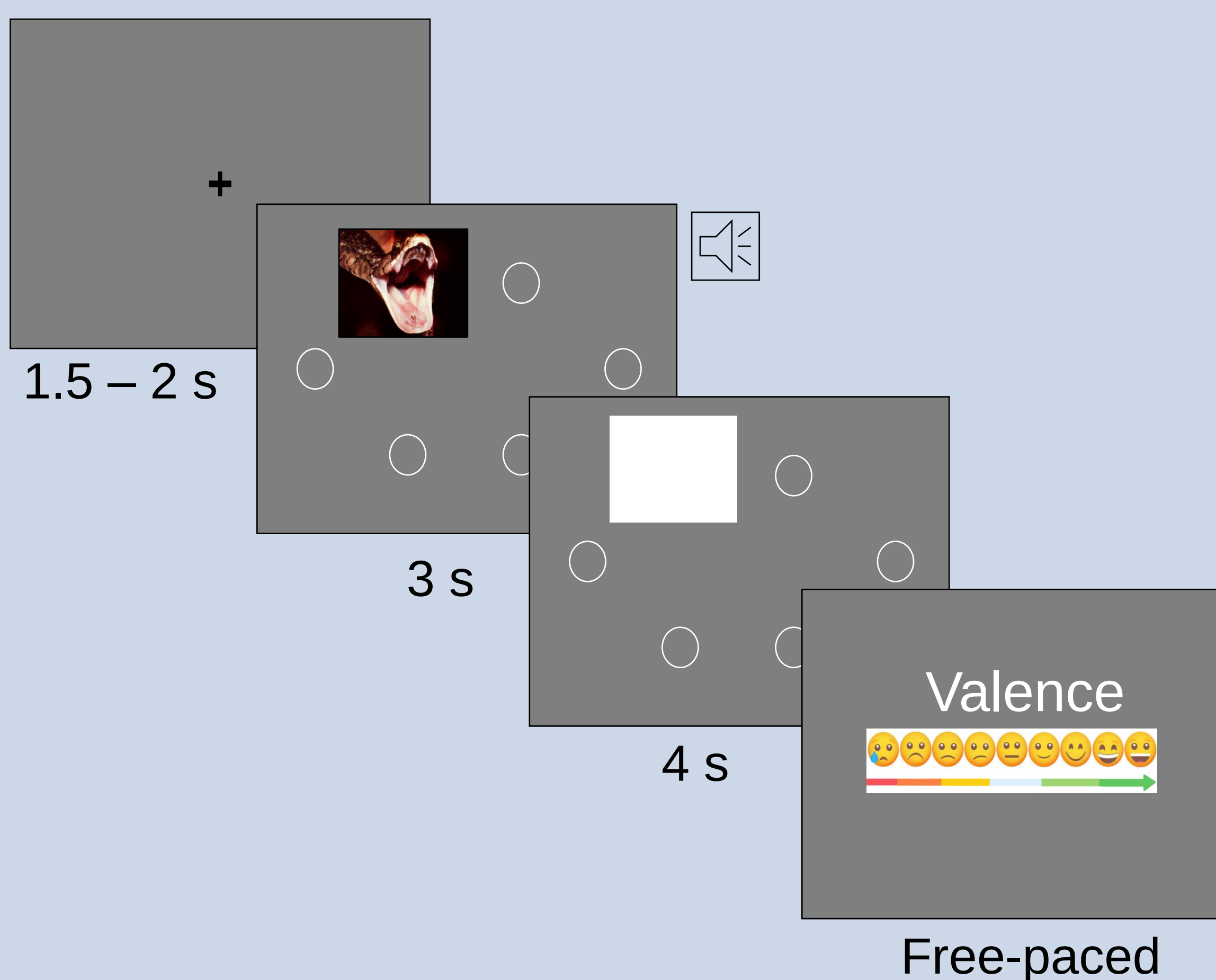
TMR in REM

Post-sleep Test
Phase

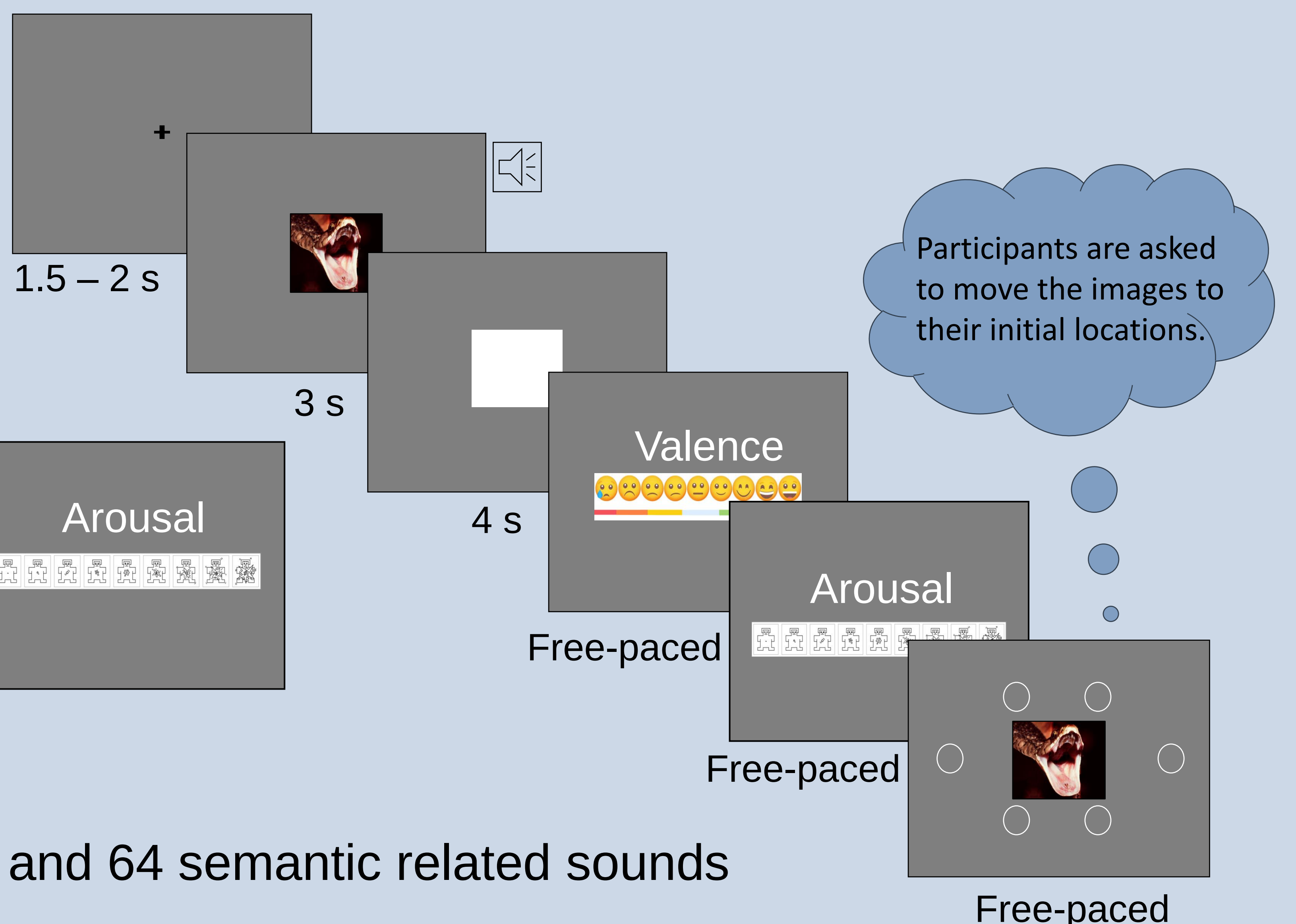
Follow up Test
Phase

EEG and ECG recording

Spatial Memory Learning Phase



Spatial Memory Test Phase



Stimuli: 64 images (32 negative & 32 neutral) and 64 semantic related sounds

Reference

1. Hutchison et al. (2021). *Targeted memory reactivation in REM but not SWS selectively reduces arousal responses. Communications Biology.*
2. Greco et al. (2024). *Disarming emotional memories using targeted memory reactivation during rapid eye movement sleep. bioRxiv.*
3. Rudoy et al. (2009). *Strengthening individual memories by reactivating them during sleep. Science.*
4. Yüksel et al. (2025). *Both slow wave and rapid eye movement sleep contribute to emotional memory consolidation. Communication Biology.*
5. Abdellahi et al. (2023). *Targeted memory reactivation in human REM sleep elicits detectable reactivation. Elife.*

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